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BACKGROUND OF THE INVENTION

Field of the Invention

[001] The present invention relates to a device testing apparatus, and more particularly, to an apparatus for automatic loading of a sleeve on a device testing apparatus, and more particularly for automatic loading of a sleeve having a device held therein on the device testing apparatus in order to carry out a device test.

Background of the Related Art

[002] In general, devices which have completed production are subjected to test for defects before shipment. For this purpose, there are horizontal device testing apparatuses, and vertical device testing apparatuses. The horizontal device testing apparatus horizontally loads devices held in a plastic tray which is, in turn, held on a metal tray having an opened top or bottom surface, performs a horizontal transfer of the devices between testing steps, and tests the devices at a horizontal testing section. In a vertical device testing apparatus, upon stacking tubular sleeves each having devices to be tested held therein on a stacker, a transfer means tilts the sleeves one by one, so that the devices are dropped from the sleeve and supplied to, and tested by, a vertical testing section.

[003] Since the present invention relates to an apparatus for automatic alignment and loading of the sleeves in a vertical device testing apparatus, a system and operation of a related art vertical device testing apparatus will be explained with reference to FIG. 1. Explanation of the horizontal device testing apparatus is omitted.

[004] Referring to FIG. 1, devices to be tested are loaded in the sleeve 1, and the sleeves 1 are loaded in succession on a loader 4 in a loading part 3 in an upper part of the

5 device testing apparatus. A transfer device (not shown) then takes the sleeves 1 one by one from a bottom of the loader 4, and transfers them to a swing arm 5 which can swing to a preset angle. Then, the swing arm 5 swings to the preset angle, for example, 45°, such that the sleeve 1 is pushed toward a transfer track 7 by an elastic force of a spring (not shown) at a rear of an insert piece 6, bringing an opening of the sleeve 1 onto a the
10 transfer track. Gravity causes the devices to drop from the sleeve 1 through an opening in the sleeve. The devices are then transferred to a testing part 8, where they are subjected to the required testing. After the devices are tested at the testing part 8, they are transferred to an unloading part 10, classified according to a test result, put into empty sleeves 1a, and stacked in succession at an unloading stacking part 11 by a transfer device
15 (not shown).

[005] However, the related art vertical device testing apparatus requires a worker to manually line up and load each of the sleeves 1 on the loader 4 at required positions on the loading part 3. Thus, the loading of sleeves is troublesome, inefficient, and results in poor test efficiency.

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SUMMARY OF THE INVENTION

[006] Accordingly, the present invention is directed to an apparatus for automatic loading of a sleeve on a device testing apparatus that substantially obviates one
25 or more of the problems due to limitations and disadvantages of the related art.

[007] An object of the present invention is to provide an apparatus for automatic loading of a sleeve on a device testing apparatus, in which sleeves having

5 devices to be tested held therein are loaded on the device testing apparatus, automatically.

[008] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the
10 written description and claims hereof as well as the appended drawings.

[009] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, the apparatus for automatic loading of a sleeve on a device testing apparatus includes a sloped loading plate for putting sleeves each having devices held therein thereon, vertical fixation plates at both
15 sides of the sloped loading plate, carrier means fitted so as to be in contact with a lower edge of the sloped loading plate, for holding the sleeves put on, and slid down to the lower edge of, the sloped loading part, and transporting to a loading part in the device testing apparatus one by one in succession, driver means fitted to the fixation plate for driving the carrier means, and return means for, when a plurality of sleeves on the sloped
20 loading plate are loaded on, and transported by the step, returning the sleeves back to the sloped loading plate again, leaving only one of the sleeves.

[010] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

25 BRIEF DESCRIPTION OF THE DRAWINGS

[011] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this

5 specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention:

In the drawings:

FIG. 1 illustrates a side view of key parts of a related art vertical device testing apparatus;

10 FIG. 2 illustrates a side view of key parts of a vertical device testing apparatus having an apparatus for automatic loading of a sleeve in accordance with an embodiment of the present invention;

FIG. 3 illustrates a perspective view of an apparatus for automatic loading of a sleeve in accordance with an embodiment of the present invention; and,

15 FIG. 4 illustrates a side view of the apparatus for automatic loading of a sleeve of FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[012] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. FIG. 20 2 illustrates a side view of key parts of a vertical device testing apparatus having an apparatus for automatic loading of a sleeve applied thereto. The apparatus 100 for automatic loading of a sleeve is mounted at one side of the loading part 3 in an upper part of the device testing apparatus, for automatic alignment and supplying of sleeves 'S,' which are loaded with devices to be tested, to the loading part 3.

25 [013] FIG. 3 illustrates a perspective view of an apparatus for automatic loading of a sleeve 'S' in accordance with a first embodiment of the present invention.

[014] Referring to FIG. 3, there is a sloped loading plate 101 sloped backward in

5 a lower part of the apparatus 100, and vertical fixation plates 102 on both sides of the
sloped loading plate 101. There is a carrier means right behind the sloped loading plate
101 for holding and transporting the sleeves on the sloped loading plate 101, and a
loading standby part (not shown) at the rear of the carrier means for temporarily holding
the sleeves 'S' until the sleeves 'S' are transported and loaded on the loading part 3 in rear
10 of the apparatus.

[015] The carrier means has a system similar to a conveyer system, and
transports the sleeves 'S' that slide down to a rear corner of the sloped loading plate due
to the force of gravity upward one by one to the sleeve loading standby part in a rear of
the carrier means, as follows.

15 [016] There is a motor 110 on an outside of one of the fixation plates 102, a
driver shaft 111 fitted across upper parts of the fixation plates 102 having one end
rotatably coupled to the motor 110, and a pair of upper pulleys 112 with an upper pulley
fixed to each end of the driver shaft 111 so as to rotate with the driver shaft 111.

[017] There is a follower shaft 113 rotatably fitted to lower parts of the fixation
20 plates 102 parallel to the driver shaft 111, with a pair of lower pulleys 114, wherein a
lower pulley is fixed at each end of the follower shaft 113, for receiving a rotation force
from the upper pulleys 112 and conveyor belts 115.

[018] The conveyor belt 115 is fitted so as to be in close proximity to a rear edge
of the sloped loading plate 101, and has steps 116 fitted on an outside surface thereof at
25 fixed intervals along a length of the conveyor belt 115 for lifting and carrying the sleeves
'S'. It is preferable that the conveyor belt 115 be positioned at an angle greater than 90°
with respect to the floor for safe transportation of the sleeves. There are guide rails 118

5 at a top inside position of the fixation plate 102 for guiding the sleeves 'S' transported by the conveyor belts 115 toward the loading part at the rear of the carrier means.

[019] In a case in which a plurality of sleeves are loaded on and transported by the step 116, the apparatus includes a return means for removing sleeves from the steps 116 such that only one sleeve 'S' is left on the step 116. The removed sleeves 'S' are then
10 returned to the sloped loading plate 101. This is necessary because the apparatus is designed such that the loading standby part (not shown) is designed to handle one sleeve at a time, and may malfunction if the conveyor belt 115 carries more than one sleeve 'S' to the loading standby part (not shown) at a time.

[020] The return means includes a second lower pulley 121 and a return pulley
15 123. The second lower pulley 121 is fixed to the follower shaft 113 at an outer side of the lower pulley 114. The return pulley 123 is rotatably fitted to a middle part of an inner side of the fixation plate 102 so as to be positioned at an outer side of the conveyor belt 115; The return pulley is connected to the second lower pulley 121 through a driving belt 122 for rotation with the second lower pulley 121.

20 [021] The return pulley 123 has a projection 124 at an outside circumference, which projects to a surface of the conveyor belt 115 in order to cause sleeves 'S' to fall off the step 116 when a plurality of sleeves 'S' are loaded on a step 116 of the conveyor belt 115 as shown in Figure 4. In this instance, the projection 124 from the return pulley 123 is designed such that the projection 124 leaves the sleeve 'S' in place when only one
25 sleeve 'S' is loaded on the step 116, and hits only upper sleeves 'S,' causing them to fall off the step 116, when a plurality of sleeves are loaded on the step 116. This is accomplished by designing each of the intervals of the steps 116 on the conveyor belt

5 115 within a preset value with respect to a diameter of the return pulley 123.

[022] The operation of the foregoing apparatus for automatic loading of a sleeve on a device testing apparatus will now be explained.

[023] Upon placing a plurality of sleeves 'S' loaded with devices on the sloped loading plate 101, gravity causes the sleeves 'S' on the sloped loading plate 101 to slides
10 down to a lower end of the sloped loading plate 101. Then, as shown in FIG. 4, the sleeve 'S' which has slid down to a corner of the lower end of the sloped loading plate 101 is caught by the step 116 on the conveyor belt 115, and transported upward, and another sleeve 'S' is caught by the next step 116 on the conveyor belt 115, thereby transporting the sleeves in succession. Therefore, the sleeves 'S' are automatically
15 transported upward by the conveyor belt 115 one by one from the sloped loading plate 101, and the user is not required to line up and load the sleeves.

[024] The sleeve 'S' transported by the conveyor belt 115 is guided by the guide rails 118 as both ends of the sleeve 'S' are inserted in the guide rails 118 at top of the fixation plate 102, and dropped, in succession, on a sleeve loading standby part (not
20 shown) ~~in~~ at the rear of the apparatus, and transferred to the swing arm 5 (see FIG. 2) by a separate sleeve conveyor (not shown) at the rear of the apparatus. Then, the devices held in the sleeves that have been transferred to the swing arm 5 are loaded on, and tested at the testing part 8 (see FIG. 2) according to a process as explained in the related art.

[025] When the conveyor belt 115 is in operation, the return pulley 123 of the
25 return means rotates, wherein if a plurality of sleeves, for example, two sleeves, are transported on the same step 116 at the same time, the projection 124 hits an upper sleeve 'S' and causes it to fall off the step 116 as the return pulley 123 rotates, and to drop

5 down onto the sloped loading plate 101 again. Thus, by the foregoing action of the return pulley 123, only one sleeve at a time is transferred to the loading standby part (not shown).

[026] Though the apparatus for automatic loading of a sleeve on a device testing apparatus 100 of the present invention is explained as applied to the device testing
10 apparatus having a system as explained in the related art, the apparatus for automatic loading of a sleeve on a device testing apparatus 100 of the present invention can be applicable to device testing apparatuses of different systems as an individual module, once a part thereof, for an example, the conveyor device which loads sleeves at the loading standby part on a loading part of the device testing apparatus is modified;
15 appropriately.

[027] As has been explained, automatic transportation, and loading of the sleeves onto the loading part once the user puts the sleeves on the sloped loading plate 101 of the apparatus of the present invention improves work and test efficiencies.

[028] Moreover, the apparatus for automatic loading of a sleeve on a device
20 testing apparatus of the present invention may be modified to serve a general purpose as an individual module, the use of which is not limited by a system of the device testing apparatus by modifying a part thereof.

[029] It will be apparent to those skilled in the art that various modifications and variations can be made in the apparatus for automatic loading of a sleeve on a device
25 testing apparatus of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications

5 and variations of this invention provided they come within the scope of the appended claims and their equivalents.

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